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Spatial concentration of industries and new firm exits: Does this relationship differ between exits by closure and by M&A?

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Abstract

New firms that locate close to other firms in the industry can experience benefits from localization economies as well as stronger competition. This paper shows that the effect of the spatial concentration of industries on the post-entry hazards of new firms differs by type of exit, and by industry. New firms located in regions with a higher relative concentration of firms in the same industry are less likely to exit by closing activities and more likely to exit by M&A. While localisation economies that favour new firms? survival or a potentially successful exit through M&A are dominant in manufacturing, new firms in business services also experience increasing competition from new entrants that lowers the likelihood of survival and exit through M&A.

Jelcodes:L20,R11

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Keywords: Firms exit, mergers and acquisitions, localisation economies, regional density, competing risks model
JEL: L20, D21, R11

1. Introduction

Recently, studies have started to systematically examine whether regional conditions affect the survival chances of new firms (e.g., SORENSON and AUDIA, 2000; FOLTA et al., 2006, FRITSCH et al., 2006; WENNBERG and LINDQVIST, 2010). These studies show that indeed regional factors play an important role and add significantly to the explanation of new business survival. However, several studies found opposing effects of the spatial concentration of industries on new firm survival. While some studies find that the survival chances of new firms increase when they are located in a region with a higher concentration of similar or related firms, often referred to as clusters (e.g., FALCK, 2007; WENNBERG and LINDQVIST, 2010), other studies show that such a location lowers the survival chances of new firms (e.g., SHAVER and FLYER, 2000; SORENSON and AUDIA, 2000; STABER, 2001; FOLTA et al., 2006). In the literature, explanations can be found for both results. Literature in economics and geography emphasizes the positive effect of the spatial concentration of industries on new firm survival because these firms benefit from agglomeration economies. Organizational ecology studies, on the contrary, argue that being located in a cluster is likely to lower firm survival chances due to the intense competition for resources in such regions. Thus, both theoretically and empirically the effect of clusters on the likelihood of new firm survival is far from unambiguous.

This lack of consistency may be due to the fact that exit is often assumed to be equivalent to the failure of a firm, while in fact firms can exit for different reasons and some forms of exit may actually be indicative of the success of the firm. Whereas bankruptcy is obviously a sign of poor performance, an exit by selling out the firm to

others may represent a successful outcome for the entrepreneur and the management (CEFIS and MARSILI, 2007). Consequently, the effect of the spatial concentration of industries may not be the same for each mode of firm exit: the co-location of similar firms may only increase the likelihood of firm exit due to merger and acquisition (M&A) and not the likelihood of closing down activities (MCCANN and FOLTA, 2008). In that case, being located in a cluster does have a positive effect on new firm performance despite the fact that the number of exits is higher in such regions. To understand how the spatial concentration of industries affects the performance of new firms, it seems therefore necessary to distinguish between the ability of a new firm to compete in the market and survive in the long term, and the possibility to opt for a potentially successful exit from the market. By combining data on the survival of firms founded in the Netherlands between 1994-1998, and on the NUTS-3 region where these firms are located, this paper examines the effects of the spatial concentration of similar or related firms on the exit probabilities of new firms, treating an exit by closure of activities (due to either bankruptcy or voluntary termination) as a separate event from an exit by M&A.

The contribution of the paper is threefold. First, it adds new evidence on the effects of regional conditions on survival probability at the firm level; such micro-level analyses are still limited compared to the more established research examining the differences in exit rates observed across regions (WENNBERG and LINDQVIST, 2010). Second, as a mirror to firm survival, this study disentangles the effects of the spatial concentration of industries on the choice of alternative, possibly successful, paths to exit, by applying a competing risks model, where the effects of a number of regional-level variables on firm-specific probabilities of exit are estimated separately for different modes of exit, while

controlling for several firm characteristics. Third, the paper examines whether the effects of spatial concentration of industries on new firm exits differ between industries including both manufacturing and business services. Although such differences have been assumed to exist (MCCANN and FOLTA, 2008), with a few exceptions (WENNBERG and LINDQVIST, 2010) most earlier studies focused on specific industries.

The remainder of this paper is structured as follows. Section 2 describes the potential differences in the effect of the spatial concentration of industries on the different modes of exit. Section 3 describes the method and the data used in the empirical analysis. The results of the empirical analyses are presented in Section 4 and discussed in Section 5.

2. Theoretical background

Economic geographers and organizational ecologists hold contrasting views about the effects of the spatial concentration of industries on new firm survival (SORENSON and AUDIA, 2000). According to the economic geographic literature, the spatial concentration of similar firms creates localization economies that increase the productivity and innovativeness of firms in those regions (MCCANN and FOLTA, 2008). Through spatially bound spillover processes, a basis of (largely tacit) knowledge is accumulated in agglomerated regions, which enables local firms to gain a competitive advantage over firms located in other regions. Localization economies have also been assumed to foster entrepreneurship, for different reasons (DELGADO et al., 2010). The existence of a system of entrepreneurs, competing firms, suppliers, customers and public organizations, embedded in a region, facilitates the identification of entrepreneurial opportunities, and increase the competitive pressure to exploit them in the marketplace.

The presence in a region of firms active in similar industries can also accelerate the exploitation of opportunities since locally established firms can provide the specialized resources and complementary assets that new firms need to commercialize their innovations.

The organizational ecology literature, on the contrary, emphasizes the more intense competition between firms in regions where an industry is concentrated. Central to this literature is the concept of density dependence, which links the viability of a new organizational form through the mechanisms of competition and legitimacy, to the number of organizational forms in the population. Density dependence in firms' hazard rates is non-linear. When population is sparse, the hazard rate decreases as the number of organizations increases and the new firm gains legitimacy, while competition is relatively weak. As the population becomes highly dense the hazard rate starts to increase, beyond a certain threshold of density, because organizations need to compete in an increasingly crowded market space, while the legitimacy gains become marginal (HANNAN and FREEMAN, 1984; CAROLL and HANNAN, 1989; GEROSKI et al., 2010).

Such competitive processes are most intense at local levels because "smaller geographical areas … are tightly bounded resource arenas" (ZUCKER, 1989, p. 543). Even when their product market is not local, firms are likely to compete with local rivals in the acquisition of resources, and especially labor, as they tend to attract most of their resources from the region in which they are located (SORENSON and AUDIA, 2000). This implies that the mechanisms of density dependence applies, even more so, at the level of regions, and when the number of similar firms located in a region increases, at least beyond a certain threshold, the survival chances of new firms become lower.

Despite the divergent interpretations, most studies in both economic geography and organizational ecology view firm survival as an indicator of firm performance, which they oppose to the occurrence of an exit as expression of the failure of the firm. However, the exit of a firm is far from a homogeneous event (SCHARY, 1991) and a better understanding of the effect of the spatial concentration of industries on new firm survival requires distinguishing the different reasons behind an exit. An exit is a clear failure for the firm that closes activities after declaring bankruptcy and for the firm that voluntary decides to terminate activities in anticipation of a possible court bound bankruptcy, trying to capitalize on the resources still available to the firm.

In contrast, an exit due to a merger or acquisition (M&A) has a more ambivalent value. In particular, the resource-based and the knowledge-based view of the firm have emphasized the importance of the transfer of intangible and knowledge assets from the acquired firm to the acquirer (RANFT and LORD, 2002) and the synergies and mutual benefits that both sellers and buyers can draw from M&As (GRAEBNER et al., 2010). The tangible and intangible assets that a firm possesses can thus represent both a source of competitive advantage, facilitating its long-term survival, as well as an attractive resource for potential buyers, increasing the chances for the firm to exit by acquisition (FREEMAN et al., 1983). For the seller, especially if a young entrepreneurial firm, an exit by M&A may represent a successful strategy to harvest economic returns and liquidate assets, especially when new (technology based) firms are backed up by venture capital, or as a strategy to sustain rapid growth in presence of managerial and financial constraints (DETIENNE, 2010). Consistent with the view that an exit by M&A may represent a sign of the success of the firm rather than of its failure, and a choice for

exploiting valuable resources as an alternative to head-to-head market competition, empirical studies have found that more innovative (and resourceful) firms are indeed more likely to experience M&A as well as less likely to fail by closing down activities (CEFIS and MARSILI, 2007; FONTANA and NESTA, 2009; WAGNER and COCKBURN, 2010). At a more aggregated level, regions and industries with higher rates of M&A also display lower rates of bankruptcy (BUEHLER et al. 2006), suggesting that an environment beneficial for firm survival can also facilitate the process of M&A.

In a similar vein, the location of a firm in a region where firms in a similar industry are concentrated, can represent a resource that positively influences both the firm's value as a potential target of M&A as well as its ability to stay in business. The likelihood of a firm to be acquired depends on its visibility to potential buyers (COFF, 1999). Being located in a concentrated region may increase the visibility of a firm, especially if this is a new venture lacking organisational legitimacy, and therefore improve the chances that potential acquirers detect it as an acquisition target and recognise its value. Not only more players in the close surroundings are aware of the existence of the firm and its potential value as a target for an acquisition, but also the reputation of the region, if this is widely identified with a successful and well-renowned cluster, may lower the uncertainty about the value of the company well outside the geographic boundaries of the cluster.

Market expansion and entry into new geographic regions are typical reasons for established firms to acquire other firms (GRAEBNER et al., 2010). Accordingly, a firm that is located in a highly dense region, where many similar firms are present, is more likely to be acquired as it provides access to local customers, and perhaps more importantly in a time of global competition, to a specialised labor market. An entry by

acquisition enables outsiders to overcome the barriers of local competition for scarce resources. As well, an acquisition of a local firm can give access to the acquirer to a system of close relationships with similar firms, embedded in the region or cluster. This type of knowledge, which is tacit and socially complex, is difficult to transfer from one organization to another (RANFT and LORD, 2002). Yet, because of this same nature of knowledge, it can be easier or quicker for an outsider to gain it through an acquisition rather than building it internally (GRAEBNER et al., 2010).

If the location in a region with a high concentration of similar firms increases the likelihood of exit by M&A, this could explain why some prior studies found a negative effect between the spatial concentration of industries and firm survival (MCCANN and FOLTA, 2008). Indeed, exit rates are higher in such regions, but these are exits that may also represent successful outcomes. This would suggest that new firms benefit from starting in a region where many similar types of firms are active. Conversely, if the spatial concentration of industries increases the likelihood of exit by termination and/or lowers the likelihood of exit by M&A, this would suggest that local rivalry dominates. The present study seeks to disentangle the (possibly opposite) effects of the spatial concentration of industries on different forms of exits.

3. Methods

3.1 The data

For the analysis two databases were combined. One is the Business Register from Statistics Netherlands. For all firms registered for fiscal purposes in the Netherlands, this dataset reports annually the number of employees, sector of activity, municipality where

the firm is located and, in case a firm changed its status in the register, the month when such an event occurred and its reason, over the period 1994-2005[i]. The events of interest for this study were the inclusion and exclusion of a firm from the register, which, given the comprehensive nature and the fiscal purpose of the dataset can be considered close proxies for the actual entry and exit of the firm from the market.

The second dataset is the national employment database LISA managed by the LISA association. This contains information regarding the address, amount of jobs, and sector for all business *establishments* in the Netherlands. This dataset is best suited to measure the spatial concentration of industries because it provides the number of jobs per single establishment. In a firm-level database such as the Business Register, the jobs of a multisite firm would all be assigned to the location of the head office.

From the LISA database regional indicators were constructed for the 40 NUTS-3 regions in which the Netherlands is divided. Each of these regions consists of a central city and the surrounding labor market area, defined using information on labor mobility. This spatial scale allows to best capture the effects of competition and agglomeration economies, considering that labor in particular is an input that firms obtain locally. Because the boundaries of each NUTS-3 region follow those of municipalities and the Business Register reports the location of a firm by municipality, the regional indicators could be matched with the firm-level data from the Business Register.

The population consists of all firms included in the Business Register as a start-up or parent spin-off between 1994 and 1998. Using their unique identification numbers, each firm could be tracked until 2005.[ii] Because the survival time of the 1998 cohort of new firms is observed for eight years at most, the maximum survival time (and therefore the

maximum age) of firms is set to eight years also for the earlier cohorts, to avoid any biases due to differences in observation period between different cohorts. The initial set of new firms was restricted to private and public limited liability companies, excluding one-man-businesses to avoid possible biases. Although one-man-businesses represent the majority of the firms (about 50%), legally, they cannot be acquired by other firms and, therefore, the Business Register reports an acquisition of this type of firms as an exit by closure.

Finally, the population was limited to all new firms in manufacturing and knowledge-intensive business services. Several studies have shown that industry characteristics affect the probability of firm survival (see FALCK, 2007) or the probability of exit by closure and by M&A (KOEKE, 2002). However, little is known about how the effects of spatial concentration on firm survival and exit vary across industries, and in particular, between manufacturing and services. Most prior studies on the effect of the spatial concentration of industries on new firm survival focused on one specific industry, mainly in manufacturing. GRAHAM (2009) is one of the few studies that did examine whether the effect of localization economies on firm performance (i.e. productivity) differs between industries. He found evidence of the existence of localization economies in manufacturing and knowledge-intensive business services, while no effect was observed for services such as retail, real estate, post and telecommunications and public services, arguably because firms in these industries locate close to consumers and therefore have low tendencies to localize. Following these insights, this study focuses on manufacturing and knowledge-intensive business services.

Furthermore, the level of competition or localization economies that new firms may experience from being located near other firms depends on to what extent these firms rely on the same resources. Accordingly local competition will be stronger within more narrowly defined industry boundaries. Therefore, more specific industries have been defined using the 5-digit NACE codes available in the Business Register (see Appendix 1). For manufacturing, three distinct types of activities are defined following the classification by VAN OORT (2004). The categories identify activities that rely on different kinds of resources: (a) labor-intensive manufacturing that mainly consists of traditional and craft-oriented industries requiring cheap labor, (b) capital-intensive manufacturing based on large scale and capital intensive production processes and (c) knowledge-intensive manufacturing activities that are largely similar to capital-intensive manufacturing except that these activities have a larger tendency towards technological dependency and innovation which requires knowledge and highly qualified employees. While all knowledge-intensive business services rely on high-qualified labor, generally five branches are distinguished which each requires specific skills: computing services; research and development (R&D); business and management consultancy; engineering; and advertising (MULLER and DOLOREUX, 2007). This classification allows to capture differences in the competition environment while maintaining a sufficient number of observations per industry and per region; at a more disaggregated level some type of exit would become too infrequent due to the focus on new firms and the limited time period for which the data is available. The final population consists of 23,945 firms for which the number of employees is known.

3.2 The empirical model

The empirical analysis examines the effects of spatial concentration on the hazard of exit by M&A and on the hazard of exit by closure, allowing for this effect to vary between the two types of exit, on the basis of a competing risks model. Competing risks models are used to model time-to-event data when more than one destination event is possible (JENKINS, 2005), and have been increasingly applied to study firm exit modes (CEFIS and MARSILI, 2007; FONTANA and NESTA, 2009; WAGNER and COCKBURN, 2010). These duration models allow estimating within the same framework effects on hazard rate, when these effects can differ between types of events. In this study, the model is specified with time-varying covariates, in the assumption that the independent variables (both at firm and regional level) may vary throughout the time period of observation, from 1994 to 2005, for example because firms move between regions or the degree of spatial concentration changes over time. The dependent variable, the time spell from the entry of a new firm (in one of the years between 1994-1998) to the time it exits, either because of closure of activity or M&A, events that are coded separately, is right censored at December 2005, the last month for which data from the Business Register is available. While the date of exit from the Business Register is reported in months, all other data from the LISA dataset, are reported annually. To maintain consistency across the variables when estimating the competing risks model with time-varying covariates, assuring that the variables change on the same time basis, the monthly information on the exit dates was transformed in yearly data. Consequently, the competing risks model was estimated in discrete-time, following the method proposed by ALLISON (1982) and extended by JENKINS (1995). Assuming that the hazard rates follow a generalized form

of the logistic function, which is a common choice for non-proportional hazards, the loglikelihood function of the discrete-time duration model can be transformed into the loglikelihood of a multinomial logit model, in which the unit of analysis is the time spell at risk, instead of the firm (ALLISON, 1982; JENKINS, 1995, 2005). Therefore it is possible to estimate the coefficients of the competing risks model by applying a multinomial logit model after re-organizing the dataset into firm-year observations. In the rearranged dataset each firm is present with multiple records, one per single year of survival before exit, or to the last year of observation if the data is right censored, (exit mode=0) and one for the year in which the firm exits (with exit mode=1 if closing down activities and 2 if exiting by M&A).

All regional variables were lagged 1 year to avoid problems of endogeneity. As the model contains variables on both the firm and the regional level, firms that are located in the same region have the same score for the regional characteristics. To avoid a bias from estimating the effects of the aggregate explanatory variables on firm-specific response variables, all models have been estimated with cluster-robust standard errors on the regional level (STEENBERGEN and JONES, 2002).

3.3 Independent variables

Using the Business Register, the LISA database and other data from Statistics Netherlands, three indicators for the spatial concentration of industries and several control variables have been composed. The measurement and dataset used for each independent variable are reported in detail in Table 1.

Insert Table 1 here

Spatial concentration of industries

The three indicators of the spatial concentration of industries are: (1) the absolute number of firms in the industry in the region (density), (2) a location quotient which measures the relative concentration of firms active in the same industry in the region, and (3) the entry rate of the industry in the region. All three measures have been used in previous research as indicators of the role of the spatial concentration of industries for firm survival, but often studies only use one indicator to test for either agglomeration economies or competition effects. However, since a prior study has shown that the different indicators lead to different results (see WENNBERG and LINDQVIST, 2010), the effect of all three indicators on the probability of exit by closure and by M&A firm is tested in this study[iii].

The three indicators for the spatial concentration of industries have been calculated in such a manner that each firm is assigned the value that is specific for the industry and region in which it is active. First, the density, the location quotient and the entry rate in each NUTS-3 region has been calculated for each industry separately. Then those data have been linked to each firm in the panel database using the information on the industry in which the firm is active and the region where it is located. Consequently, two firms that are located in the same region but that are active in different industries have different values for each spatial concentration indicator.

The first two indicators – density and the location quotients - have been measured using the LISA dataset, for each year between 1996 and 2005. As the LISA database does not provide information on all establishments in the Netherlands in 1994 and 1995, the

firms that were already active in 1994 and 1995 have been attributed the value for the spatial concentration of industry in both counts of firms and location quotients in 1996.

Density measured by the count of the number of firms in the industry in the region is expressed in logarithm values. The square term of this variable has also been calculated because the relation between the number of firms in the region and the probability of firm exit may follow a U-shape according to the organizational ecology literature. The location quotient indicates the regional differences in the share of firms in the industry compared to the national average[iv]. Regions with a score above 1 have an overrepresentation of the industry, while a score between 0 and 1 indicates an underrepresentation.

While the first two indicators capture the degree of spatial concentration for the overall population of firms active in an industry, the third indicator focuses on the concentration of new firms in the region, as expressed by the entry rate of firms in the industry in the region. In the literature, high entry rates are assumed to generate high exit rates (GEROSKI et al., 2010), for different reasons. For organizational ecologists, high entry rates increase population density and therefore the intensity of competition, leading to high exit rates. For industrial economists, entry barriers also act as barriers to exit: in markets where it is easy to enter, for example because sunk costs are low, it is also relatively easy (or inexpensive) to exit. The regional entry rate is defined as the total number of entrants in the industry in each NUTS-3 region divided by the total number of firms that were already active in that industry and region. The LISA database does not provide information on entries and, therefore, this indicator was calculated by using information on the entry date and municipality of each firm in the Business Register.

Although the Business Register does not distinguish between establishments, this is less problematic in the case of start-ups, which tend to have a single establishment, leading to limited differences in the number of start-up firms and establishments per region.

Control variables

On the regional level, three additional variables that may also affect the probability of firm exit are included in the models: the regional size, urbanisation and regional employment growth. Often the number of firms active in a specific industry is higher in regions with a higher total number of firms. To avoid that the effect of the density measure on new firm survival also reflects the general effect of the size of the region, a control variable measuring the number of employees in other industries is included in the analysis. The level of urbanization is included because firms located in more urbanized regions may have better survival chances due to urbanization economies which may stem from the larger variety of activities in such regions. The third regional control variable included in the model is the rate of regional employment growth, which has been shown to positively influence the survival probability of new firms (FALCK, 2007).

Certain firm characteristics may also affect the probability of firm exit. In particular, firm size and age influence both the probabilities of a firm to exit by closing down activities and the probability to exit by M&A (CEFIS and MARSILI, 2007). Besides the direct effects of both variables on exit probabilities, the model includes their squared terms, to account for possible non-linear effects. Because the likelihood to exit by closure and by M&A also differs between industries, dichotomous variables that indicate the industry in which the firm is active are included in all models.

GEROSKI et al. (2010) have shown that founding conditions affect firm survival rates up to several years after the start. One condition at start-up that shapes the post-entry performance of new firms is the mode of entry. According to HELFAT and LIEBERMAN (2002) the entrant's initial resources and capabilities largely depend on the entrant's ties to existing firms, as especially established firms possess a wide array of resources and capabilities. Consequently, in all models a dummy variable is included, that distinguishes between parent spin-offs, which are founded by an established firm and in which the parent firm often retains a financial interest and *de novo* entrants, which are stand-alone companies that have no legal relationship with established firms in the industry. Because of the strong ties with an established firm, parent spin-offs can draw on a richer pool of resources, which can make them more capable of surviving as well as a more attractive target of M&A. In this study it is not possible to control for differences in survival with respect to other categories of entrepreneurial spin-offs, i.e. *de novo* entrants that are founded by former employees of incumbent firms in the same industry (HELFAT and LIEBERMAN, 2002). Typically entrepreneurial spin-offs are more likely to survive than *de novo* entrants whose founders have no relevant prior working experience (e.g. KLEPPER, 2010). However, distinguishing this category requires information about the prior employment of the founder(s), which is not available in the Business Register.

Besides firm-specific founding conditions, also external factors that characterize the environment at the time a new firm is created, such as differences in total entry rates or GDP growth, exert long-lasting effect of post-entry performance (GEROSKI et al., 2010). To control for such differences in founding conditions, dummy variables for each cohort are included in all analyses.

Finally, to control for macroeconomic changes between 1994 and 2005, the annual growth rate of the national gross domestic product (GDP) is included. Previous studies have shown that a higher GDP growth rate decreases the likelihood of exit by closure, while it increases the likelihood of exit by M&A (BUEHLER et al., 2006).

4. Results

Table 2 presents the descriptive statistics of the independent variables for all new entrants[v]. The high variance inflation factors (VIFs > 8) showed that including all three indicators of the spatial concentration of industries in one model simultaneously was not possible as this would cause problems with multicollinearity. Therefore, two models have been estimated. Model 1 includes only the count of the number of firms in the industry in the region (density), as indicator of spatial concentration. Model 2 includes both the relative measure for the spatial concentration of the total number of firms in the industry (location quotient) and the entry rate of the industry in each region (entry rate). As shown in Table 2, the VIFs for these two models are below 5, indicating that organized in this way the data did not pose a problem of multicollinearity. Table 3 presents the results of the competing risks model estimated for all firms (3a) and each industry separately (3b).

Insert Table 2 here

Spatial concentration of industries

Table 3a reports the estimates of Model 1 and 2 for the overall set of activities in manufacturing and services considered in the analysis. Model 1 shows that density does

not have a statistically significant effect (either linear or through the squared term) on the probability to exit, whether this concerns a closure or an exit by M&A. However, in model 2, where the spatial concentration of industries is measured by the location quotient and the entry rate, both indicators have statistically significant effects on exit probabilities. Specifically, the probability to exit by closure decreases with the relative share of firms in the industry, and increases with the entry rate of the new firms in the industry. The effects of these variables on the probability to exit by M&A are also statistically significant, but have opposite signs. That is, new firms are more likely to exit by M&A in a region where firms of the same industry are relatively more concentrated, and where the inflow of new firms is lower.

Thus the effect of spatial concentration of industries on exits seems to depend on how the concentration is measured. Contrary to what is stated in organizational ecology, no significant advantage or disadvantage of being located near a higher number of similar firms is found for new firms. However, the effects of the spatial concentration of industries become evident when considering the level of industry specialization and the dynamics of new entries in the region. The sign of these effects show that the regional factors that lower the probability to exit by closure are also associated with a higher probability to exit by M&A, suggesting that an exit by M&A may represent a successful path to exit. The location quotient and the entry rate also seem to capture contrasting spatial concentration effects, as they influence exit probabilities (both by closure and by M&A) in opposite direction. In sum, for the complete set of industries the results suggest that new firms do benefit from being located in a region where incumbents are concentrated, but a higher share of entrants in the region lowers their chances for both

survival and a possible successful exit, possibly due to increased competition for resources among the newly created firms.

Insert Table 3a & 3b here

To obtain insights in to what extent the effect of the spatial concentration of industries on the probability to exit differs between industries, the models have been estimated for each industry separately (Table 3b). A number of differences emerge across industries. While there is still no evidence of density dependence in the probability of exit by closure for most industries, the relationship is U-shaped in knowledge-intensive manufacturing firms (Kiman). For this industry, the two coefficients of density and its squared term are statistically significant with negative and positive sign respectively. Thus the probability of closing down a firm declines with density up to a certain threshold after which the probability increases with a further increase in density.

The negative effect of the location quotient on the probability to exit by closure found for all firms (Table 3a), appears to be driven by the statistical significant effects in two services sectors: business and management consultancy (B&MC) and engineering (Table 3b). The same goes for the positive effect of entry rate on the probability of closure, which is only statistically significant for computing services and business and management consultancy activities. The survival chances of new firms in the services sector appear to be more threatened by the entry of other new firms in the region than manufacturing firms for which the coefficient of entry rate is generally not significant.

For firms active in Research and Development (R&D) and advertising, no statistically significant effects are found of spatial concentration on the probability of closing down.

Also for exit by M&A, the effect of density, which was non-significant in the total model (Table 3a), becomes statistically significant in two industry-level estimates: capital-intensive and labor-intensive manufacturing. In these industries, new firms are more likely to exit by M&A when they are located in regions with a higher number of firms in the same manufacturing activity. For labor-intensive manufacturing, this effect tends to be non-linear, as the coefficient of the squared density is positive and marginally significant. This implies, as also confirmed by an examination of the log odds ratio curves, that the probability to exit by M&A increases with density but at a decreasing rate, leveling off when the number of similar firms in the region becomes higher. These results confirm the findings of a prior study by FOLTA et al. (2006) that the benefits of being located in a cluster declines as the cluster grows because of increasing costs due to congestion and competition effects.

The location quotient maintains the positive and statistically significant effect on the probability of exit by M&A found in the total model in three industries, labor-intensive manufacturing, business and management consultancy, and engineering. In these industries, new firms located in regions with higher relative shares of similar firms are more likely to exit by M&A. A contrasting effect emerges in R&D services, where the effect of location quotient is statistically significant but negative on the probability to be acquired. The R&D sector distinguishes itself from others services since all the coefficients of the spatial concentration indicators that are statistically significant have a negative sign. New R&D firms in regions with a higher concentration of other R&D

firms, in absolute or relative terms, either established or newly entered, have a lower probability to be acquired than those located in less concentrated regions.

The industry-level estimates also confirm that competition from new entries in a region lowers new firm's probability to exit by M&A, in three services industries: computing services, business and management consultancy, and R&D. This effect is particularly evident for computing services, since all other indicators of regional concentration are not significant (for both exit by closure and by M&A). In computing services, the competition for resources among new entrants in regions with a higher concentration of these activities seems to outweigh any possible advantage of co-location.

Contrary to the estimates of the total model and the models for services, in labor-intensive manufacturing the entry rate has a positive, instead of negative, effect on the probability to exit by M&A. In this industry, all three indicators of spatial concentration affect the probability to exit by M&A in the same way. Co-location effects increase the likelihood that a new labor-intensive manufacturing firm is acquired whether these effects are related to the absolute or relative presence in the region of similar firms, and either established or newly created. Finally, it can be noted that, similar as found for exit by closure, in advertising, none of the three indicators of the spatial concentration of industries have a statistically significant effect on the probability exit by M&A. In this industry, clustering does not seem to affect new firm's probability to either close down activities or to sell them to others.

Overall, the models indicate that new firms seem to benefit from the spatial concentration of firms active in the same industry, as the firms founded in such regions are more likely to survive and more likely to be acquired. Zooming into the differences

between industries, the results suggest that although new firms in manufacturing mainly seem to benefit from being located in regions with a higher concentration of similar firms, as they are more likely to survive and to be acquired there, these firms also seem to be affected by some crowding out effects due to the (too high) presence of similar firms in the region. In addition, compared to manufacturing firms, new firms in several knowledge-intensive business services industries are more exposed to competition from other incoming new firms. Thus, a high concentration of firms active in business services does seem to generate agglomeration economies improving the survival chances of new entrants, while many other new entrants in the industry in the region leads to competition effects lowering the likelihood of survival or of an exit by M&A.

Control variables

The size and urbanization of a region, do not have a statistically significant effect on the probability of a new firm to exit by M&A, while both increase the likelihood that a new firm closes down (Table 3a). Although it is often assumed that the wide variety of activities in urban areas has a beneficial effect on firm performance, within the Netherlands, survival chances of new firms in such regions are lower. A possible interpretation of this result is that switching costs are lower in such regions. Entrepreneurs of new firms in larger and more densely populated regions have greater access to alternative business opportunities and therefore they require a higher level of performance to keep them from abandoning their firm (see MCCANN and FOLTA, 2008). Regional employment growth, on the contrary, has no effect on the likelihood that new firms close down, but positively influences the probability to exit by M&A. Thus,

new firms started in regions with higher employment growth have greater opportunity to be acquired by other firms.

Firm size has a U-shaped effect on both exit modes, shown by the negative and statistically significant linear effect and the positive effect of its squared term. In other words, both the probability to exit by closure and by M&A first decreases and then increases with firm size. However, a more detailed look at the shape of the log odds ratio curve as a function of firm size shows that the minimum is reached at a much larger firm size for an exit by closure (about 26 employees) than for exit by M&A (a bit less than 5 employees)[vi]. This implies that for most new firms the probability to exit by closing down activities decreases with firm size, while the probability to exit by M&A first decreases, but relatively quickly increases with firm size.

The effect of the firm age on the probability to exit by closure and exit by M&A is also statistically significant in both the linear and quadratic terms, but the quadratic terms have opposite signs for the two exit modes. An examination of the log odds ratio curve as a function of age shows that the probability to exit by closure first quickly decreases with age and after about four years becomes stable. The estimate coefficient of firm age on the probability to exit by M&A is negative both for the linear and the quadratic term, indicating a sharper decline in the probability to exit by M&A as a new firm grows older.

Confirming the expectation, parent spin-offs are more likely exit by M&A than *de novo* entrants. Some differences in both the likelihood to exit by closing down and to exit by M&A are also observed between industries and between years of entry.

Finally, at the macro level, the rate of GPD growth has a statistically significant effect by lowering the probability to exit by closure and by increasing the likelihood to exit by

M&A. General economic conditions favorable for firm survival tend also to increase exits by M&A, consistent with the interpretation of an M&A as a successful exit.

5. Conclusions

This paper has investigated the effects of the spatial concentration of industries on the probability of exit by closing down activities (due to bankruptcy or voluntary termination) and exit by M&A for all Dutch firms established in manufacturing and knowledge-intensive business services between 1994 and 1998. In general, the results show that the spatial concentration of industries has a positive effect on the likelihood that new firms exit by M&A, while it lowers the likelihood of an exit by closing down activities. MCCANN and FOLTA (2008) suggested that such a result could explain how it is possible that "…whereas agglomerated firms tend to perform better, they also tend to be less likely to survive." (p. 550). The lower survival rates of new firms in clusters found by SORENSON and AUDIA (2000) and STABER (2001) may not be caused by more firms closing down activities, but by more firms merging with or selling out to another company. The fact that the spatial concentration of industries stimulates both firm survival and an exit by M&A suggests that, in general, a merger or acquisition represents a successful exit strategy for a new firm, a viable alternative to continue competing in the market, and that this choice is influenced, among other factors, by the location in a cluster. However, the benefits that new firms experience from being located near similar firms seem to be limited to the presence of incumbents, as higher entry rates in the industry and region were found to lower new firms' probabilities of survival and acquisition. As especially new firms rely on external resources, these results fit the

assumption made in the organizational ecology literature that once the number of similar firms entering a region becomes too high the positive effect of clustering may turn negative due to increased competition for resources (SORENSON and AUDIA, 2000).

The results did not resolve the ambiguity about whether new firms that are located in a cluster mainly experience positive or negative effects of that location. The industry-level models suggest that the opposing effects of localization economies and competition seem to balance out differently between industries. New manufacturing firms that are located in clusters are either more likely to exit by M&A (labor-intensive and capital-intensive activities) or more likely to survive (knowledge-intensive activities), suggesting that these firms mainly benefit from the spatial concentration of similar firms. Although new firms in some business services were also found to experience the benefits of such a location, they are confronted with increased competition as well. Higher entry rates in the region lower the probability that new firms survive and exit by M&A in computing services, R&D and business and management consultancy. In computing services and R&D, the negative effects of a location in a cluster even prevail, as for those firms, no evidence is found of any positive effect of being located near similar firms.

The results of this study clearly show that firms located in clusters can experience the effects of both localization economies and increased competition and, therefore, the insights of both economic geography and organizational ecology should be taken into account when studying the effect of clustering on new firm survival. Furthermore, the results also show that whether competition or localization economies prevail in clusters depends on the industry being studied. Therefore, further work is required to obtain a better understanding of what causes those differences in the effect of clustering on new

firm exits between industries. A possible reason may be that between industries large differences exist in market structure and entry barriers, causing differences in the level of local competition, but it may also be caused by changes in the effect of clustering during the industry life cycle, as suggested by TER WAL and BOSCHMA (2010).

Although the number of studies examining the effect of clustering on new firm survival is quickly growing, until now, hardly any attention has been paid to how it affects the process of M&A. This study contributes to illustrating the relationship between clustering and M&A, and suggests possible directions for further research. First, the present analysis focused on the characteristics and location of new firms when regarded as potential targets of an M&A, but it did not account for the characteristics and location of the acquirer. Bringing together information on the two parties involved in an acquisition can provide more insights about the impact of clustering on M&As. Second, the study examined the occurrence of an M&A for new firms, without any specification of conditions that could qualify the nature of this event, in particular whether the M&A involved positive or less positive terms for the acquired firm. The assumption made is that the observation of effects of opposite sign for the same factors on an exit by M&A and an exit by closure is indicative of the fact that the former is mostly a successful exit. Further insights on to what extent an exit by M&A indeed represents a successful outcome could be gained by complementing a similar type of analysis, which distinguishes different modes of exit, with other indicators of firm performance.

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Appendix 1 Industry definition

Industry	2 or 3-digit NACE codes (revision 1.1)	New firms 1994-1998 (number)	Proportion of closure 1994-2005	Proportion of M&A 1994-2005
Capital-intensive manufacturing	Food products and beverages	1,032	32.9	14.5
	Tobacco products			
	Pulp, paper and paper products			
	Rubber and plastic products			
	Other non-metallic mineral products			
Labor-intensive manufacturing	Textiles	2,056	32.4	13.4
	Wearing apparel; dressing and dyeing of fur			
	Leather and leather products			
	Wood and wood products			
	Fabricated metal products			
	Furniture			
	Recycling			
Knowledge-intensive manufacturing	Coke, refined petroleum products and nuclear fuel	2,163	29.5	12.0
	Chemicals and chemical products			
	Basic metals			
	Machinery and equipment			
	Office machinery, computers, electrical machinery and apparatus			
	Radio, television, communication equipment and apparatus			
	Medical, precision and optical instruments, watches			
	Motor vehicles, (semi-)trailers			
	Other transport equipment			
Computing services	Computer and related activities	4,646	26.8	14.3
R&D	Research and development	401	23.9	10.5
Business & and man. Consultancy	Business and management consultancy	8,558	21.5	10.5
Engineering	Architectural and engineering activities and related technical consultancy	3,571	23.3	12.2
	Technical testing and analysis			
Advertising	Advertising	1,518	32.9	12.6

Table 1. Measurement of independent variables

Name	Measurement	Source
Regional characteristics		
Density	Number of firms active in one of the eight industries (see Appendix 1) in each NUTS-3 region, 1996-2005	LISA 2006
Location quotient	Share of firms active in one of the eight industries located in each NUTS-3 region divided by the share of firms active in that industry in the Netherlands, 1996-2005	LISA 2006
Entry rate	Number of new entrants in one of the eight industries divided by the total number of firms in the industry in each NUTS-3 region, 1994-2005	Business Register 1994-2005
Regional size	Total employment in a NUTS-3 region minus the employment at firms active in the industry	LISA 2006
Urbanization	Average number of jobs per square kilometer in each NUTS-3 region, 1994-2005	Statistics Netherlands 2010
Regional employment growth	Growth of the number of employees compared to previous year in each NUTS-3 region, 1994-2005	Statistics Netherlands 2010
Firm internal characteristics		
Size	Number of employees, 1994-2005	Business Register 1994-2005
Age	Number of years since year of entry	Business Register 1994-2005
Parent spin-off	A firm that has been founded by an established firm or not (1/0)	Business Register 1994-2005
Industry	The industry in which the firm is active based on 5-digit NACE code (1/0)	Business Register 1994-2005
Cohort	The year in which the firm has been founded: 1994, 1995, 1996, 1997 or 1998	Business Register 1994-2005
Macroeconomic conditions		
GDP Growth rate	Change in GDP compared to previous year, 1994-2005 (%)	Statistics Netherlands 2010

Table 2. Descriptive statistics

	Independent variables	Mean	S.D.	VIF Model 1	VIF Model 2
1	Ln(Size)	1.068	0.892	1.05	1.05
2	Log(Age)	1.411	0.469	1.52	1.52
3	Parent spin-off	0.013	0.113	1.03	1.03
4	Labor-int. manufacturing	0.082	0.274	1.23	1.28
5	Knowledge-int. manufacturing	0.860	0.280	1.11	1.17
6	Capital-int. manufacturing	0.038	0.280	1.05	1.11
7	Computing services	0.196	0.370	1.30	1.61
8	R&D	0.016	0.124	1.03	1.03
9	Business and man. consultancy	0.368	0.482	1.64	1.50
10	Engineering	0.151	0.358	1.26	1.26
11	GDP growth rate	3.186	1.423	2.47	2.50
12	Ln(Density)	6.816	1.019	1.87	-
13	Location quotient	1.089	0.290	-	4.44
14	Entry rate	0.123	0.042	-	4.59
15	Ln(Regional size)	11.931	0.825	1.30	1.29
16	Urbanization	399.388	334.593	1.29	1.29
17	Regional employment growth	1.030	0.028	1.92	1.92

Table 3a. Results of competing risks model for all firms

Exit mode		Model 1		Model 2	
	Variables	Coeff	P-value	Coeff.	P-value
Closure					
Firm level	Ln(Size)	**-.564**	(.000)	**-.563**	(.000)
	Size squared	**.084**	(.000)	**.084**	(.000)
	Log(Age)	**-1.097**	(.000)	**-1.103**	(.000)
	Age squared	**.366**	(.000)	**.367**	(.000)
	Parent spin-off	-.061	(.655)	-.061	(.653)
	Labor-intensive manufacturing	**.288**	(.000)	**.315**	(.000)
	Knowledge-intensive manufacturing	**.151**	(.033)	**.182**	(.009)
	Capital-intensive manufacturing	**.393**	(.000)	**.441**	(.000)
	Computing services	**-.103**	(.057)	**-.131**	(.019)
	R&D	-.137	(.192)	**-.172**	(.039)
	Business & management consultancy	**-.440**	(.000)	**-.463**	(.000)
	Engineering	**-.259**	(.000)	**-.257**	(.000)
	Advertising (Ref.)	**-**	-	-	-
	1994 cohort	-.076	(.222)	**.566**	(.000)
	1995 cohort	**-.230**	(.000)	**.317**	(.000)
	1996 cohort	**-.130**	(.002)	.029	(.589)
	1997 cohort	**-.121**	(.000)	.012	(.731)
	1998 cohort (ref.)	-	-	-	-
Macro-level	GDP growth rate	**-.107**	(.000)	**-.112**	(.000)
Spatial concentration	1. Ln(Density)	.055	(.761)	**-**	-
	Ln(Density squared)	-.005	(.702)	-	-
	2. Location quotient	-	-	**-.083**	(.084)
	3. Entry rate	**-**	-	**.659**	(.073)
Regional conditions	Ln(Regional size)	.062	(.139)	**.051**	(.055)
	Urbanization (x 1,000)	**.107**	(.037)	**.100**	(.053)
	Regional employment growth	.383	(.622)	.439	(.560)
M&A					
Firm level	Ln(Size)	**-.390**	(.000)	**-.390**	(.000)
	Size squared	**.107**	(.000)	**.107**	(.000)
	Log(Age)	**-.785**	(.006)	**-.796**	(.005)
	Age squared	**-.421**	(.000)	**-.423**	(.000)
	Parent spin-off	**.473**	(.003)	**.470**	(.003)
	Labor-intensive manufacturing	.090	(.572)	-.081	(.592)
	Knowledge-intensive manufacturing	-.090	(.560)	-.205	(.154)
	Capital-intensive manufacturing	.145	(.426)	-.014	(.941)
	Computing services	.150	(.288)	**.215**	(.077)
	R&D	-.040	(.867)	-.136	(.515)
	Business & management consultancy	-.074	(.599)	**-.230**	(.066)
	Engineering	-.030	(.831)	-.080	(.493)
	Advertising (Ref.)	**-**	-	-	-
	1994 cohort	**.741**	(.000)	**.479**	(.000)
	1995 cohort	**.706**	(.000)	**.577**	(.000)
	1996 cohort	**.749**	(.000)	**.749**	(.000)
	1997 cohort	**.674**	(.000)	**.570**	(.000)
	1998 cohort (ref.)	-	-	-	-
Marco-level	GDP growth rate	.122	(.119)	**.136**	(.081)
Spatial concentration	1. Ln(Density)	.153	(.663)	-	-
	Ln(Density squared)	-.019	(.500)	-	-
	2. Location quotient	-	-	**.153**	(.026)
	3. Entry rate	-	-	**-2.581**	(.000)
Regional conditions	Ln(Regional size)	.078	(.138)	.010	(.782)
	Urbanization (x 1,000)	-.054	(.532)	-.072	(.475)

Regional employment growth	**4.985**	(.066)	**4.804**	(.079)
Log likelihood	-35,527.27		-35,516.48	
Wald Chi square	3342.19		3363.77	
p-value	0.000		.000	
Number of observations	113,945		113,945	
Number of firms	23,945		23,945	

Notes: significant results (p<0.10) in bold. The dependent variable is the probability of an exit event and the probability of the continuing state (or survival) in a time spell, the latter selected as base outcome

Table 3b. Results of competing risks model for eight industries separately

Variables	*Ciman*	*Liman*	*Kiman*	*Computing services*	*R&D*	*B&MC*	*Engin.*	*Advert.*
Closure								
Ln(Density)	-.330	.996	**-3.289**	-.118	.778	-.196	-1.006	.090
	(.774)	(.270)	(.000)	(.763)	(.720)	(.536)	(.116)	(.860)
Ln(Density squared)	.014	-.101	**.304**	.019	-.063	.001	.063	-.002
	(.890)	(.145)	(.000)	(.505)	(.679)	(.958)	(.238)	(.962)
Location quotient	.182	-.253	-.097	.124	-.656	**-.278**	**-.360**	.096
	(.356)	(.178)	(.641)	(.134)	(.367)	(.027)	(.004)	(.463)
Entry rate	-1.621	2.620	2.438	**1.030**	-2.446	**2.081**	1.349	.381
	(.528)	(.434)	(.414)	(.070)	(.466)	(.037)	(.270)	(.832)
M&A								
Ln(Density)	**3.144**	**1.970**	.213	.750	4.146	.584	.752	.167
	(.080)	(.055)	(.884)	(.307)	(.184)	(.354)	(.534)	(.841)
Ln(Density squared)	-.250	**-.140**	-.024	-.064	**-.411**	-.060	-.093	-.036
	(.152)	(.084)	(.852)	(.300)	(.064)	(.199)	(.331)	(.550)
Location quotient	.346	**.453**	.112	.191	**-1.833**	**.221**	**.372**	-.147
	(.166)	(.029)	(.579)	(.245)	(.057)	(.076)	(.039)	(.611)
Entry rate	3.518	**9.834**	3.570	**-3.750**	**-5.295**	**-6.725**	2.478	.056
	(.492)	(.037)	(.239)	(.000)	(.094)	(.000)	(.419)	(.987)
N of obs	4,282	9,353	9,795	22,337	1,788	41,932	17,183	7,273
N of firms	1,032	2,056	2,163	4,646	401	8,558	3,571	1,518

Notes: Ciman = Capital-intensive manufacturing, Liman = Labor-intensive manufacturing, Kiman = Knowledge-intensive manufacturing, B&MC =Business and management consultancy, Engin. = Architectural, engineering and technical testing and analysis activities, Advert. =Advertising. The effect of regional density has been estimated in separate models. Significant results (p<0.10) in bold.

[i] Due to a major reorganization of the Business Register in 2006, it is not possible to track firms after 2005.

ii The period of observation (1994-2005) overlaps with what is known as the fifth merger wave (since 1900) with its rising tide in 1995-2000, and sees the beginning of the sixth wave that started to appear in 2004 (SCHENK, 2007). In the empirical analysis we control for changing conditions in aggregate (and regional) growth over time, which are considered main determinants of the occurrence of merger waves (BUEHLER et al., 2006).

[iii] Contrary to WENNBERG and LINDQVIST (2010), the employment in the industry in the region is not included, because the number of firms in the region is more likely to capture the effect of both competition between firms and agglomeration economies because these follow from external economies of scale (learning between firms, job mobility).

[iv] LQ = $\dfrac{N_{ij} / \sum_{j} N_{ij}}{\sum_{i} N_{ij} / \sum_{ij} N_{ij}}$ N = number of firm, i = region, j = industry

[v] The descriptive statistics are calculated as the means of current values per year over the whole period of observation (1994-2005) with the exception of the spin-off variable, which is defined at the time of entry.

[vi] Plots of the log odds ratios of the probabilities to exit by closure and by M&A (with respect to the survival probability) as a function of firm size are available on request.